

32=14). Even if it takes Country Y a while to detect the cheating, Country X loses in the end. For example, if it takes Country Y 30 trials of the game to detect the cheating, Country X's gain is 180. Once cheating is detected, it takes only 13 trials for Country Y to wipe out Country X's gain from cheating. Thus, in this example punishment means strategic non-cooperation.

Extending this understanding to the subcontinent scenario, we understand that a coordinated mutual agreement through constructive dialogues, consistent with the individual sovereignty of the native governments in the subcontinent is necessary along with bilateral commitment to maintain that agreement. All political trust deficits must be overcome to ensure the elimination of illegal migration. Even if migration across the international borders continues, it should be mostly legal and only for the enhancement of socio-economic conditions in both the source and the destiny.

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Environment and Economic Growth: Instruments for Sustainable Development

Divya Singh

'Am I to sign a blank cheque and give away the livelihoods of billions of people without even knowing what the EU roadmap contains?' India's minister of Environment, Jayanthi Natarajan asked the world at the Climate Change conference held in Durban in December last year. "Differentiated responsibility" emerged as the new norm. Environmental degradation has been one of the central issues to our goal of sustainable development. Barbier and Markandaya (1989) suggest an essential criterion for sustainable development is: maintaining the net benefits of economic development subject to maintaining the services and the quality of resources over time. The recent rush of higher GDP levels has often been accompanied with higher extraction and exploitation of exhaustible resources. The solution faces debate on two fronts: a) to have a cost effective incentive based approach and b)

to have an equitable solution i.e. the countries that have polluted more, should pay more. The former can be addressed through market based instruments which is the focus of my paper while the later which Natarajan called issue of 'differentiated responsibility' is rather a political issue that I leave to our political leaders.

Incentives or Lack Thereof: Root of Problem?

Markets work through incentives. Where there are no markets or costs are not truly represented, there is overuse of resources or in other words, there is an inefficient outcome. Consider the problem of climate change. In game theory sense, it can be seen as a public good. The climate change can be achieved if at least some countries say k , contribute towards it. Contribution entails a cost. Let total number of countries be n . Then $1 \leq k \leq n$. Any country is better off if it doesn't contribute and still climate change is achieved. The worst case scenario shall be when it contributes and still the good is not provided. It can be seen that the Nash equilibrium is when exactly k contribute. In this case, $n-k$ countries free ride on others.

The economic growth in modern times involves a tradeoff between environment sustainability and GDP rate. The churning of fuel in machines or the grinding of chemicals in tubes produces harmful gases or waste that is not properly disposed. The environmental degradation has emerged because apparently there is no market for pollution or that pollution is an externality. The private optimum level of pollution for an individual firm is greater than what is socially desirable.

It is pretty much clear that the environment degradation is largely a market failure problem.

A number of instruments have been adopted over time to address the issue but they have aimed far from the target.

Instruments to tackle environmental degradation

1. Command and control approach

As soon as the problem became apparent, the knee jerk reaction led to regulation. Over time, different countries have set forward their own limits on firms. In India, the Central Pollution Control Board has been entrusted with such powers under the Air Act 1981. National Air Monitoring Programme has been a big step to control and measure air quality. Though the instruments are easier to implement, they face the same problems that resulted in the problem of environmental degradation i.e. lack of incentives and cost measure. The limits imposed do not take into account the control costs that vary across the firms. Also keeping a check on defaulters incurs extra burden.

2. International cooperation

In 1992, countries negotiated the United Nations Framework Convention on Climate Change. Since then, they have been engaging in negotiations at conference of parties. It resulted into Kyoto Protocol that was adopted in 1997. The latest conference at Durban has suggested its continuation till 2020 until a modified and more 'fair' protocol is agreed upon. Nevertheless, the entire experience of 'negotiations' has shown the difficulty in coming to a consensus. This is more like a Prisoners' Dilemma situation where all countries are better off if they reduce their

emissions while each is individually better off if it continues to pollute.

		Player 2	
Player 1		<i>Abate</i>	<i>Pollute</i>
	<i>Abate</i>	{10, 10}	{0, <u>11</u> }
	<i>Pollute</i>	{ <u>11</u> , 0}	{ <u>1</u> , <u>1</u> }

The Nash equilibrium is {Pollute, Pollute}. However, each country's individual payoff (1 each) would have been higher if they would have cooperated and chosen to abate. (payoff=10 in that case). Even in the continuous strategy space, Finus (2003) shows that each country that maximizes its profits (difference between emission benefit functions and damage functions) will emit more than social optimum.

Of course, in the long run, countries shall learn from their experience and cooperation becomes a rational strategy in the repeated games. But in the immediate future, we will have to look beyond 'cooperation' to tackle the problem.

3. Market Based Instruments

Many economists have advocated these instruments since their conceptualization. The support rests on their cost effectiveness and rationality. They work though influencing the behavior of economic agents such as households and firms by creating economic incentives/disincentives. The Kyoto protocol specifically allows emissions among Annex B (mainly industrialized) countries but with a commitment to a given level. In order to emit beyond that limit, Clean Development Mechanism (which allows them to invest in emission reducing techniques in developing countries) and Joint Implementation have been

provided for. These instruments work by equating marginal costs of abating pollution across the firms. The developing countries face an advantage because they are in process of upgrading technology hence marginal cost of lowering emissions are lower there.

The cost effectiveness of MBIs have been demonstrated by Gupta (2002) by considering five highly polluting industries (Aluminum smelter, caustic soda, cement, iron and steel etc.) in five high polluting states: Maharashtra, Andhra Pradesh, Gujarat, Tamil Nadu, Uttar Pradesh. The costs of abatement under uniform limit and under limits based on marginal costs are compared. The ratio of the cost of 50 per cent reduction for CAC and MBI for each state comes out greater than 1.

India has a lot of potential for MBIs because of the 'low fruit opportunities' that she enjoys. The efficiency of implementation can be further improved by removing energy subsidies and introducing carbon taxes. Larsen and Shah (1992) estimate that reducing world subsidies at US\$230 would reduce global carbon emissions by 9% and that carbon tax is progressive and will help in reducing the fossil fuel consumption.

However caution must be taken in adopting these instruments blindly. Some of the pre-conditions for the successful adoption of incentive based instruments like well-functioning markets, reasonably effective tax administration, monitoring instruments are missing. There is too much reliance on 'pseudo-monitoring and enforcement'. Reforms like improving monitoring standards, introducing

pecuniary awards to SPCB staff for detecting violations, installation of modern techniques etc. can go a long way in making the road of MBIs in India smoother.

Remarks & conclusion

Climate change has seen intense debate over the past few decades. The alignment of interests has rarely been observed. In the meantime, it is better to rely on the markets than the fickle minded human psychology. It is not to undermine the role of state or overemphasize the power of markets. Both play a promising role. Yet, cooperation is difficult to achieve in short run because of the inherent 'tendency to cheat'. Market based instruments offer an easier, simpler solution provided adequate infrastructure exists for their successful implementation. They are cost effective as was shown in case of the study by Gupta (2002) as compared to traditional command and control approach which makes regulation a tedious job. Introduction of carbon taxes and removal of energy subsidies can help along the way. Finally, I would like to stress the role of 'cooperation' between the state and the private sector. It was observed when the German standards put a ban on leather exports from India. The government banned the use of chemicals while the government's key research institutes and export association engaged in developing more environmental friendly ones. The degree of porosity and state support helped in making the reentry of Indian leather industry in the export market possible in short time.

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BUZZWORDS OF THE YEAR

The National Food Security Bill: Food For Thought

Priyamvada Jha

The National Food Security Bill or the 'Right to Food Act' for poor Indians is the most ambitious project of the United Progressive Alliance which is about to enter the law making arena. Under this Act, all the below poverty line (BPL) households will be entitled to 25 kg rice or